

Applicant: Ishiduka et al.
Amendment and Response of October 13, 2009
Response to Office Action of July 10, 2009
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Remarks/Arguments:

Claims 1-2 and 4-24 are currently pending in this application. Claims 1, 5, 9, 16 and 20 have been amended. Claim 2 has been cancelled. Support for the amendments can be found in the specification as originally filed. Applicants respectfully request reconsideration of the application based on the following remarks.

Applicant's Response to Examiner's Objection

Claims 9 and 20 have been objected to for including the incorrect spelling of "norbornyl". The term "norbolnyl" has been replaced with "norbornyl". As such, it is respectfully submitted that this rejection has been rendered moot.

Applicant's Response to 35 U.S.C. §112, second paragraph

Claims 5 and 16 are rejected under 35 U.S.C. §112, second paragraph as allegedly being indefinite. In particular, the term "the constitutional unit (a4)" allegedly has insufficient antecedent basis. The word "the" was replaced with "a". As such, it is respectfully requested that this rejection be withdrawn.

Applicant's Response to 35 U.S.C. §103 (a) Rejection over Kanna

Claims 1-2, 4-12 and 15-23 are rejected under 35 U.S.C. §103(a) as allegedly being unpatentable over U.S. Patent Publication No. 2004/0009430 to Kanna et al. (hereinafter "Kanna"). Applicants respectfully traverse this rejection and request reconsideration on the basis that Kanna fails to render the claims obvious.

The Examiner acknowledges that Kanna does not teach the combination of recurring units (a1), (a2) and (a3), but alleges that:

...it would have been obvious to one of ordinary skill in the art to combine the recurring units because Kanna teaches recurring units combined in any combination as shown increases solubility of the resin in an alkali developer, has less line edge roughness

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and less development time.

(Office Action, at page 4) (citations omitted).

Claim 1 has been amended. In particular, the subject matter from claim 2 has been incorporated into claim 1. Nowhere in Kanna is such a positive-type resist composition for liquid immersion lithography disclosed or suggested.

Kanna discloses a resin, which corresponds to a resin component (A) of the present invention whose solubility in an alkali developing solution increases by the action of the acid. The resin of Kanna includes repeating units having groups represented by general formula (Z), and repeating units whose solubility in the alkali developing solution increases as a result of decomposition by the action of an acid.

The recurring units referenced by the Examiner are examples of repeating units whose solubility in an alkali developing solution increases as a result of decomposition by the action of an acid. The repeating units are used together with the repeating units having groups represented by general formula (Z). Although Kanna discloses an acrylic ester unit by way of F-39 on page 21, nothing is disclosed or suggested regarding acrylic ester unit (a1) of the present invention.

The repeating units whose solubility in an alkali developing solution increases as a result of decomposition by the action of an acid. The repeating units are used together with the repeating units having groups represented by general formula (Z). Although Kanna discloses an acrylic ester unit by way of B-8' of page 36, nothing is disclosed or suggested regarding the use of acrylic ester unit (a1) of the present invention.

Kanna discloses use of a resin having the repeating units shown by general formula (Z) as an essential component, and further, disclose a very broad range of the combination of

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repeating units that enables the co-use of the repeating units having the groups shown by general formula (Z). Co-use of repeating units of methacrylic ester and acrylic ester of the present invention in a specified ratio by selecting from among the broad range of combination of repeating units of Kanna or the effects thereof as a result of using such resin in a resist composition for immersion lithography is not obvious or easily anticipated by one of skill in the art.

Kanna has the objective of providing a resist composition showing sufficient transmissibility when using a 157 nm light source, improved solubility with respect to an alkali developing solution, reduced line edge roughness, and a reduced developing time. However, Kanna does not disclose the use of a characteristic exposure method such as immersion lithography.

The combination of repeating units for constituting the resin disclosed in Kanna covers a very broad range. Contrary to the Examiner's allegation, it would not have been easy to select from among the broad range a combination of repeating units for constituting a resin suitable for a resist composition for immersion lithography having a high contact angle with respect to the immersion liquid, excellent in liquid immersion characteristics, and in particular, having a high barrier property with respect to water.

In the positive-type resist composition according to the present invention, a resin component (A), whose solubility in an alkali developing solution increases by the action of an acid, contains specified constitutional units of acrylic ester (a1) and methacrylic ester (a2), thus, use of an exposure method such as liquid immersion lithography, obtains a resist composition having a high contact angle with respect to the immersion liquid, a higher dissolution resistance, and in particular, a high barrier property with respect to water. When the present invention employs water as the immersion liquid, a resist pattern having superior resolving ability is achieved.

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Furthermore, the co-use of the constitutional units of methacrylic ester and acrylic ester in a specified ratio, obtains a positive-type resist composition having decreased surface roughness and line edge roughness during etching, and having superior resolving ability and increased depth of focus.

In addition, transparency of the photoresist film using an ArF exposure can be improved when a divalent or trivalent cyclic group expressed by X of the constitutional unit of acrylic ester (a1) includes an aliphatic cyclic group.

Although Kanna discloses repeating units of methacrylic ester and acrylic ester, nothing is disclosed or implied regarding the use of both units in a specified ration or effects thereof.

In view thereof, claims 1-2, 4-12 and 15-23 are not obvious in view of the teachings of Kanna. Applicants respectfully request reconsideration of the Section 103 rejection based on this combination.

Applicant's Response to 35 U.S.C. §103 (a) Rejection over Kanna in view of Endo

Claims 1, 12 and 13 are rejected under 35 U.S.C. §103(a) as allegedly being unpatentable over Kanna in view of U.S. Patent Publication No. 2004/0259040 to Endo et al. (hereinafter "Endo"). Applicants respectfully traverse this rejection and request reconsideration on the basis that the combination of references fails to render the claims obvious.

The Examiner acknowledges that Kanna does not disclose a resist composition that may be formed by immersion exposure, but alleges that:

Endo teaches an immersion exposure method comprising supplying water as the immersion liquid onto a resist film, exposing through the immersion liquid, baking and developing the resist film. It would have been obvious to one of ordinary

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skill in the art to use immersion exposure in the composition of Kanna because immersion exposure is well known to improve resolution and refine patterns at conventional exposure wavelengths.

(Office Action, at page 5) (citations omitted).

As described in detail above, claim 1 has been amended.

Kawashima discloses a technique for an immersion exposure method using an ArF laser as a light source and using water as the immersion liquid. However, Kawashima does not disclose or suggest a structure of a resin for use in a resist composition for achieving the objectives of the present invention.

The immersion exposure method is a technique which, instead of using a shorter light source wavelength in order to achieve a high resolution, uses a light source having the same wavelength as the exposure method of prior art to achieve a high resolution.

Co-use of the repeating units (a1) and (a2) constituting a resin suitable for a resist composition for immersion lithography to obtain the above-mentioned effects could not easily have been conceived by one skilled in the art in view of Kanna and Endo.

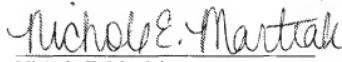
In view thereof, claims 1, 12 and 13 are not obvious in view of the teachings of Kanna, alone or in combination with Kawashima. Applicants respectfully request reconsideration of the Section 103 rejection based on this combination.

Should the Examiner have any questions or comments concerning the above, the Examiner is respectfully invited to contact the undersigned attorney at the telephone number given below.

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The Commissioner is hereby authorized to charge payment of any additional fees associated with this communication, or credit any overpayment, to Deposit Account No. 08-2461. Such authorization includes authorization to charge fees for extensions of time, if any, under 37 C.F.R. § 1.17 and also should be treated as a constructive petition for an extension of time in this reply or any future reply pursuant to 37 C.F.R. § 1.136.

Respectfully submitted,


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